5.0 PROJECT DESCRIPTION

5.1 PROJECT INDENTIFICATION / SCOPE OF PROJECT

Yukon Energy is proposing to develop the Project to connect the WAF and the MD power grids. The Project includes a new 138 kV transmission line generally along the Klondike Highway from Carmacks to Stewart Crossing (the CS line), a 35 kV spur line from Minto Landing out to the Minto Mine Site (the MS line), new transmission substations at Carmacks, Pelly Crossing, Minto Landing, and changes to the existing substation at Stewart Crossing.

5.1.1 Principal Project

The Project is an enhancement opportunity which will interconnect the MD and WAF grids. This new transmission project will provide surplus WAF grid hydroelectric power to the new copper-gold mine under development at Minto Mine; and it will also in the near-term provide the opportunity for grid hydroelectric power for any future mining developments in the Project Study Region (e.g. the Carmacks Copper Mine). The Project will also enhance overall WAF and MD system reliability, economic efficiency and flexibility in resource use. A schematic of the proposed Project in relation to Yukon Energy's existing network has been previously illustrated in Figure 2.2-1.

The selected route for 138 kV CS transmission line, as described in Chapter 7, is approximately 172 km in length. The selected route for the 35 kV MS transmission line is approximately 27 km in length and will start at the Minto Landing substation, follow the access road through the community of Minto Landing to the existing barge landing site, cross the Yukon River at the barge landing site, and then generally follow the mine access road from the southern shore of the Yukon River, to the mine site. Poles will be either wood or metal and could be either a single or H frame design.

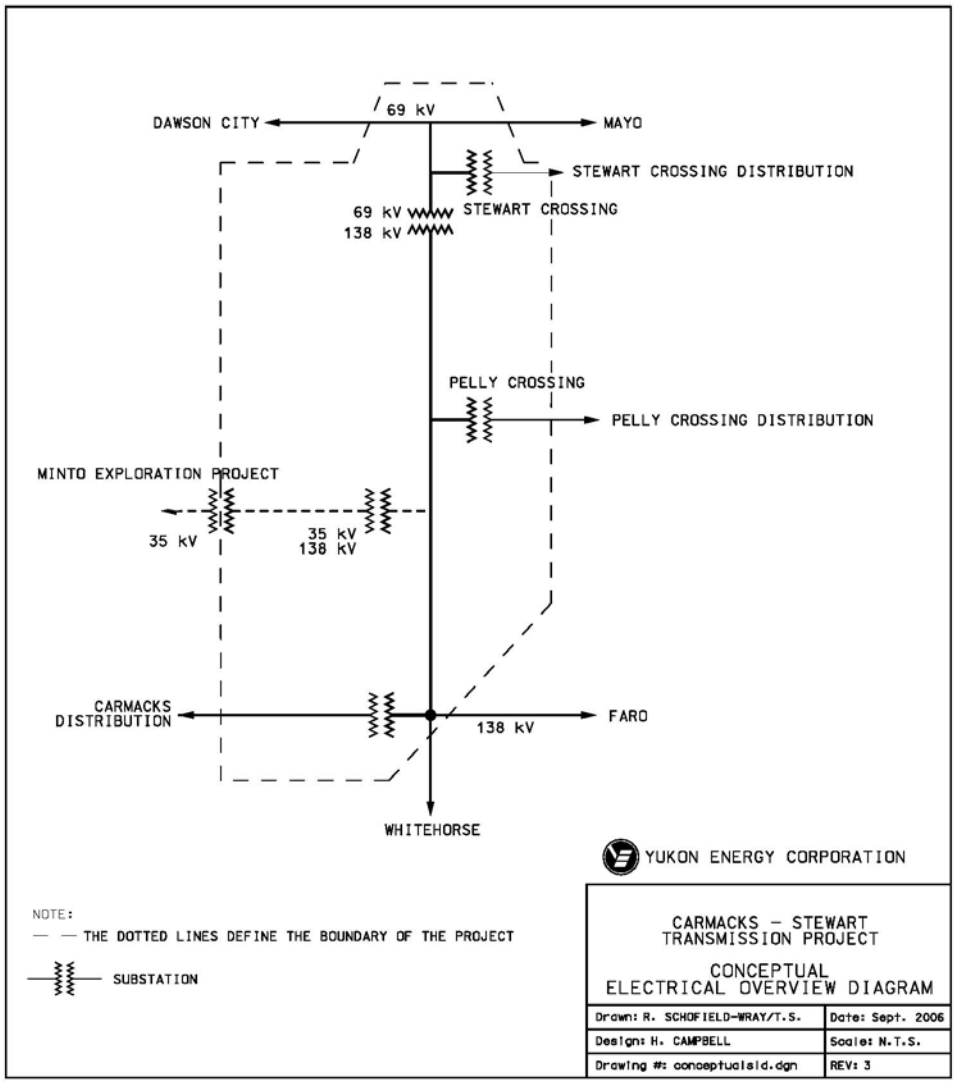
The Project will be constructed in two stages. Stage One will include the 138 kV CS line from Carmacks to Pelly Crossing, the 35 kV MS line from Minto Landing to the mine site, new substations in Carmacks, Minto Landing and at Pelly Crossing, and a step-down transformer at the Minto Mine Site. Stage One of the Project will enable the Minto Mine Project, owned by Sherwood Copper[1], to access surplus grid power rather than continue to rely on diesel generation. The CS line will also allow Pelly Crossing, a community relying on diesel generation, to have access to hydro power. The extension of grid power between Carmacks and Pelly also provides opportunity for future development to access grid power, including any future community at Minto Landing.

Stage Two will include the continuation of the 138 kV CS line from Pelly Crossing north to Stewart Crossing and the expansion of the existing Stewart Crossing substation. Stage Two of the Project will connect the two existing power grids, providing long-term benefits to all Yukoners, including the encouragement of development along the corridor and enhancing overall system reliability and flexibility.

[1] Sherwood Copper Corporation's wholly owned subsidiary Minto Explorations Ltd. is developing the Minto Mine.

Figure 5.1-1 shows a conceptual electrical overview of the Project and the connection to the existing WAF electrical grid at Carmacks and to the MD grid at Stewart Crossing.

Figure 5.1-1
Conceptual Electrical Overview Diagram



5.1.2 Activities of Other Projects

Connections to new electrical loads, such as future mines (e.g. Carmacks Copper Mine connection in future by Yukon Energy), or new distribution such as YECL providing grid power to Pelly Crossing will be done with new transmission or distribution lines off the main CS transmission line. Similarly, connection of the new Carmacks substation to the distribution facilities serving Carmacks will require a new distribution line connection by YECL (at which time Yukon Energy would anticipate decommissioning and removal of its existing Carmacks substation). Approval for these other transmission or distribution lines (and any related decommissioning of existing facilities) is not part of the Project. Each other project, if

justified, would require separate environmental and regulatory approvals and accordingly would be the subject of a separate application as required when and if the project was to be developed.

5.2 ALTERNATIVES AND CHOSEN APPROACH

As stated previously, the Project will enhance overall WAF and MD system reliability, economic efficiency and flexibility in resource use. This flexibility in resource use will allow surplus hydroelectric power to be provided to potential future development.

5.2.1 Alternatives to the Project

Alternatives to the Project are either a 35 kV transmission line to service the Minto Mine Project only; or not proceeding with the Project, resulting in continued reliance on diesel by the Minto Mine and community of Pelly Crossing (as well as other future developments in the Project Study Region). These are described below.

5.2.1.1 35 kV line to Minto Mine:

This alternative would be developed to meet the needs and requirements of the Minto Mine Project. A LOI between Yukon Energy and Sherwood Copper in March 2006 agreed to work towards developing a PPA to provide electric grid power from the WAF grid before the end of 2008. If this WAF grid power was not available through the currently contemplated Project, a separate 35 kV line between Carmacks and the Minto Mine site would be developed along the same route.

The elements of this alternative Minto Mine Transmission Project would include:

- a new substation in Carmacks;
- a 35 kV line from the new substation in Carmacks generally following the Klondike Highway north to a Yukon River crossing in the vicinity of Minto Landing; and
- a 35 kV line generally following the existing Minto Mine Project access road, to terminate at a step-down transformer at the Minto Mine site.

Minto Explorations Ltd. (the wholly owned subsidiary of Sherwood Copper) is currently developing the Minto Mine and intends to start production in the spring or early summer of 2007 using on-site diesel generation to supply its power needs until such time as grid power can be provided by the Project.

Upon completion and hook up of the 35 kV transmission line, WAF grid power would be available to the Minto Mine site during the remaining life of the mine and subsequent shut down activities, currently estimated at ten to more than thirteen years. This project alternative by itself would result in the continued reliance on diesel power for the community of Pelly Crossing unless YEC was to extend the 35 kV line from Minto Landing to Pelly Crossing (this would be seriously considered, pursuant to the MOU with NTFN). The 35 KV option from Carmacks to Minto Landing and/or Pelly Crossing, however, would not be of sufficient voltage to supply future potential mines such as the Carmacks Copper Mine Project in the Williams Creek area. This alternative would also not support future interconnection between the WAF and MD systems. Unless long-term expected service could justify its retention, the 35 kV line would be

partially or completely decommissioned at the end of the mine life with limited, if any, future long-term benefits to Yukoners.

5.2.1.2 Do not proceed with the Project or any other option:

If the decision is made not to proceed with the Project or any other new transmission option, the following would not be realized:

- The provision of grid power to future mining development along this route would not be possible, including the Carmacks Copper Mine Project. Inability to secure grid power would adversely affect mine operating costs and economics, reducing royalties to government and potentially First Nations, and increasing diesel **generation greenhouse gas** (**GHG**'s) emissions.
- Pelly Crossing would continue to have long term reliance on diesel power.
- Interconnection of Yukon Energy's existing power grids would not be realized, thus preventing this improvement to Yukon Energy's overall system reliability and efficiency.
- Economic development opportunities that could be realized in the Project Study Region with grid power may not be encouraged.

5.2.2 Alternative Means of Carrying out the Project

This will be addressed in *Chapter 7* of this document as part of the route selection process.

5.2.3 Comparison and Selection of Alternatives

This will be addressed in *Chapter 7* of this document as part of the route selection process.

5.3 TECHNOLOGIES

Previous projects in the Yukon Territory have utilized transmission line design and technology similar to that proposed for the Project. The WAF transmission line is a 138 kV line utilizing the same style of poles, conductor wire and insulators which will be used in the proposed Carmacks to Stewart Crossing line segments. These materials have been used in the climatic extremes that are experienced in the Yukon Territory and Northern British Columbia. Construction of the 35 kV spur line will be similar in design to Yukon Energy's and YECL's current distribution lines elsewhere in the Yukon. The design will be to Yukon Energy standards which are consistent with industry practices in North America.

Throughout the Project Proposal, standard environmental protection practices as found in Yukon Energy's **Environmental Management System** (**EMS**) (see Appendix 5A) will be applied to construction, operation, maintenance and eventual decommissioning of the project components.

Following receipt of the required environmental approvals, a Project specific EPP will be developed to guide contractors as well as Yukon Energy staff. The EPP, which will be founded on the basis of Yukon Energy's EMS document appended to this Project Proposal, outlines specific mitigative measures, including any required monitoring to be implemented during all phases of the project (construction,

operation & maintenance and decommissioning). The EPP will be generally developed to accomplish the following goals:

- To facilitate the mitigation of environmental effects throughout the full life cycle of the project by providing clear reporting protocols for field construction and operating personnel;
- To incorporate issues and concerns identified by the public during the PIP;
- To identify modifications to construction methods or schedules, summarize environmental sensitivities and mitigation actions;
- To provide specific information on practices to be utilized during the clearing and construction phases of the project; and
- To monitor clearing and construction (including a NTFN monitor) to ensure that the work proceeds according to the EPP.

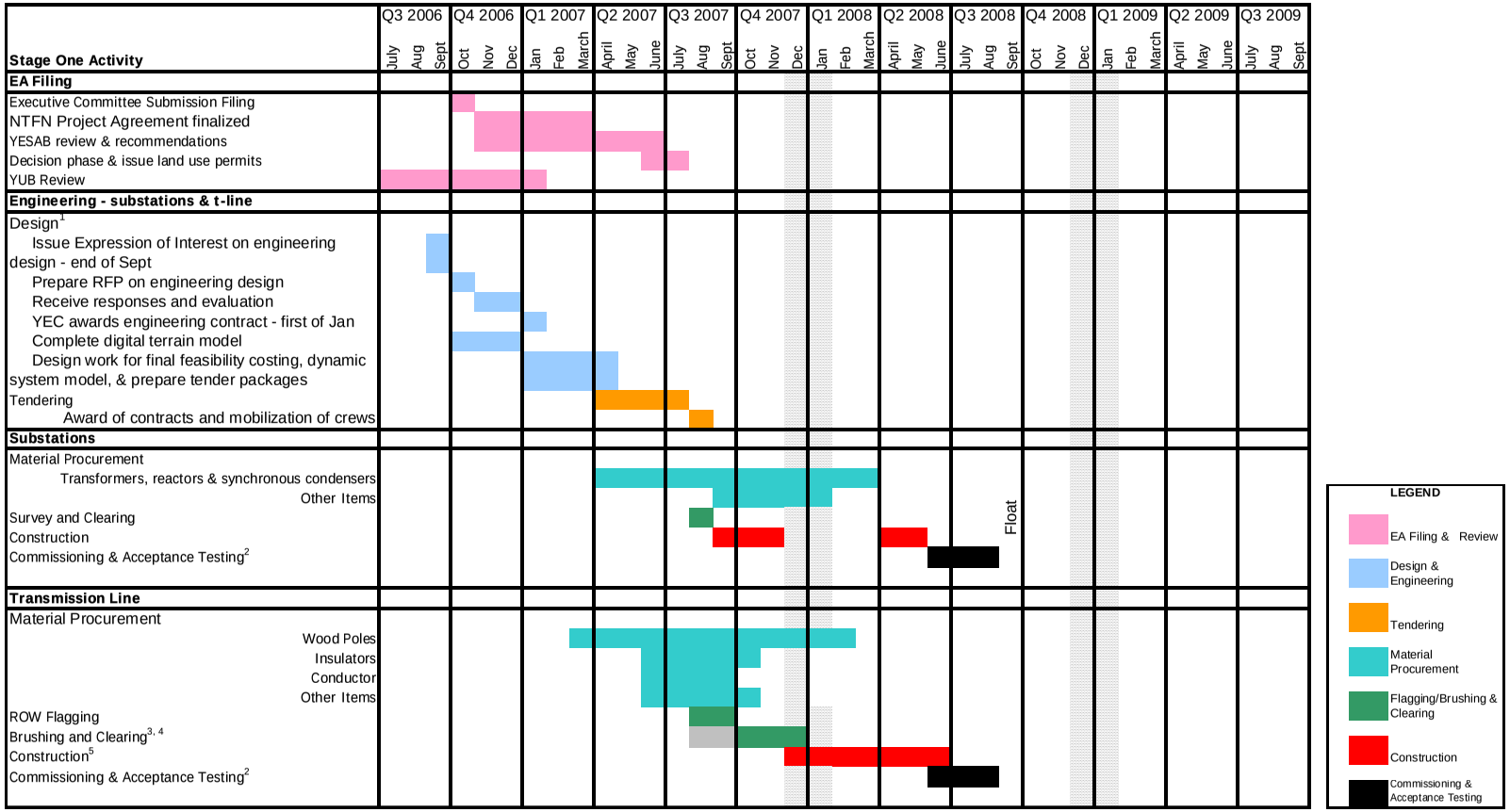
5.4 PROJECT CONSTRUCTION STAGES AND SCHEDULING

5.4.1 Project Construction Schedule

As previously noted, the Project is anticipated to be built in two stages subject to provision of Yukon Government funding plus mine customer contributions. If a staged approach to construction is followed Stage One to Pelly Crossing would begin construction preparation early in 2007, with a projected completion in the third quarter in 2008. Stage Two is currently anticipated to begin in early 2008, with anticipated project completion in the third quarter of 2009.

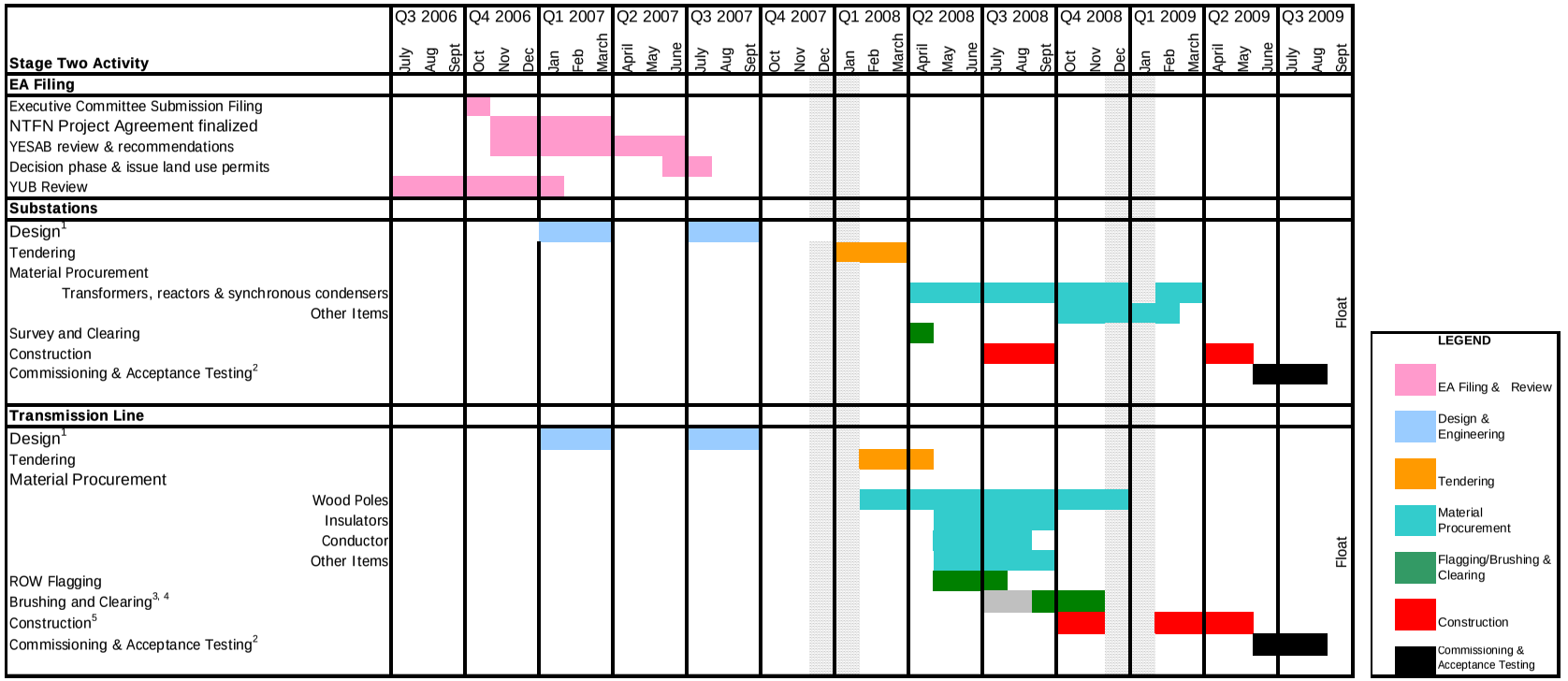
Figure 5.4-1 provides a summary of the timing of anticipated Project construction activities for Stage One. Figure 5.4-2 provides a similar summary for Stage Two.

Figure 5.4-1
Anticipated Project Schedule for Stage 1



[1]Preliminary design work for Stages 1 and 2 is anticipated to be done in IQ1 2007. If YG funding for Stage 2 does not materialize, Stage 2 final engineering and design will face material delays. [2] Commissioning is done by the contractor; Acceptance Testing is done by Yukon Energy - both take approximately 6 weeks each. [3]The grey part of the clearing schedule could accommodate advance permits for cutting fuel wood and merchantable timber. Once this time frame has past the ROW is brushed and cleared to the standard required for the transmission line. It is important that any sections of the corridor used for fuel wood or timber harvesting be surveyed and flagged prior to issuing any permits. [4] The months of May and June are not used for brushing and clearing of the ROW to reduce the impact on nesting birds (Yukon Energy, 2005) and spring break-up. [5] Line construction must occur after brushing and clearing is well in hand. Line construction over the small number of wetland sites will occur primarily in winter to minimize the impact on wetlands and permafrost soils.

Figure 5.4-2
Anticipated Project Schedule for Stage 2



[1] It is anticipated that Preliminary design will occur for Stage 2 in Q1 of 2007, with final design work occurring in Q3 2007 depending on funding from YG. [2] Commissioning is done by the contractor; Acceptance Testing is done by Yukon Energy - both take approximately 6 weeks each. [3]The grey part of the clearing schedule could accommodate advance permits for cutting fuel wood and merchantable timber. Once this time frame has past the ROW is brushed and cleared to the standard required for the transmission line. It is important that any sections of the corridor used for fuel wood or timber harvesting be surveyed and flagged prior to issuing any permits. [4] The months of May and June are not used for brushing and clearing of the ROW to reduce the impact on nesting birds (Yukon Energy, 2005) and spring break-up. [5] Line construction must occur after brushing and clearing is well in hand. Line construction will occur primarily in winter to minimize the impact on wetlands and permafrost soils.

5.4.1.1 Preparation and Line Construction Timing

Timing of ROW clearing and brushing will be subject to physical and biophysical sensitivities such as spring nesting season for birds in May and June, and avoidance of wet/rainy seasons. The anticipated schedule in Figures 5.4-1 and 5.4-2 incorporates these sensitivities.

Stage One will include the 138 kV line from Carmacks to Pelly Crossing and the 35 kV Minto spur line. Meeting an in-service date in the third quarter of 2008 would require the following:

- Approvals by June/July 2007, including any required Yukon Government funding and authorizations.
- Flagging of the ROW will need to occur in early third quarter of 2007 with a possible overlap with clearing of merchantable timber. Areas of merchantable timber and fuel wood will be surveyed first based on the available forest inventory maps from Yukon Forest Management Branch.
- Brushing and clearing is anticipated to commence in late third quarter of 2007 (if ROW flagging finished), or start of Q4; and be completed by end of January 2008. Any work that requires winter clearing will occur during the winter months of 2007/2008. Yukon Forest Management Branch may be interested in issuing timber harvesting permits in advance of the scheduled brushing and clearing work to encourage the harvesting and utilization of merchantable timber and fuel wood.
- Pole framing and setting – to commence in 4th quarter 2007 and be completed by first quarter of 2008 (weather dependent).
- Line stringing – this will start after pole framing and setting is well in hand, likely first quarter 2008, with completion by second quarter 2008.
- Line commissioning and acceptance testing – second and third quarter of 2008.

Stage Two will include the 138 kV line from Pelly Crossing to Stewart Crossing, with an in-service date in the third quarter of 2009. It is possible that funding for Stage One and Stage Two will be separate; in which event Stage One may proceed and Stage Two may face material delays relative to the schedule assumed in Figure 5.4-2.

- Approval of required **Yukon Government** (**YG**) funding and authorizations prior to Q1 2008.
- Flagging of the ROW will need to occur in second quarter of 2008 with a possible overlap with the clearing of merchantable timber. Areas of merchantable timber and fuel wood will be surveyed first based on the available forest inventory maps from Yukon Forest Management Branch.
- Brushing and clearing is anticipated to occur in the third to fourth quarter of 2008. Any work that requires winter clearing will occur during the winter of 2008 - 2009. Yukon Forest Management Branch may be interested in issuing timber harvesting permits in advance of the scheduled brushing and clearing work to encourage the harvesting and utilization of merchantable timber and fuel wood.

- Pole framing and setting - to commence late in fourth quarter of 2008 and be completed by the second quarter of 2009.
- Line stringing - first to second quarter of 2009.
- Line commissioning – second and third quarter of 2009.

5.4.1.2 Substation Construction Timing

- Construction of the Stage One substations is anticipated to commence in the third quarter of 2007 with clearing and civil work (including build up of gravel pad). Construction of electrical equipment and fencing will occur in the second quarter of 2008 (provides for the long-lead time for equipment such as transformers, reactors and synchronous condensers).
- Expansion of the existing Stewart Crossing substation for Stage Two is anticipated to commence in the third quarter of 2008 with clearing and civil work (including build up of gravel pad). Construction of electrical equipment and fencing will occur in the second quarter of 2009.

5.4.1.3 Access and Transportation Timing

Stage One

Access to the transmission line ROW during Stage One construction is anticipated to be spread out over four quarters, starting with ROW flagging and salvage of merchantable timber and followed by brushing and clearing of the transmission line ROW. Equipment used for these activities will be traveling the Klondike Highway, the Minto Mine access road and access trails during Q4 of 2007.

Pole location staking is anticipated to start in the fourth quarter of 2007 in areas where ROW brushing and clearing is complete. Pole placement and line construction will likely begin in the first quarter of 2008 with projected completion in the second quarter of 2008. Initially work will occur in the winter taking advantage of the frozen ground conditions to reduce the possibility of any impact on wetlands or permafrost areas and to avoid disturbance to nesting birds in May and June. These activities will utilize the Klondike Highway, the existing Minto Mine access road, existing access trails and cleared ROW as travel routes.

Clearing of the required all-weather access road to the substation locations and all clearing and ground work of the substation sites is anticipated to occur in the third and fourth quarters of 2007. This will be followed by the construction of the site infrastructure and connection of the lines in the second quarter of 2008. The Carmacks substation will be fenced and gated. There will be a vehicle access gate and a personnel gate which will be kept locked. The Pelly Crossing and Minto Landing substations will follow a similar schedule and procedure for access. The Minto Mine site transformer and associated equipment will be within the prepared site of the Minto Mine Site substation.

Stage Two

Access to the transmission line ROW during Stage Two construction is anticipated to be spread out over five quarters, starting with ROW flagging and salvage of merchantable timber and followed by brushing

and clearing of the transmission line ROW. Equipment used for these activities will be traveling the Klondike Highway and access trails over the third and fourth quarters of 2008.

Pole location staking, placement and line construction is anticipated to begin in the fourth quarter of 2008 with projected completion in the second quarter of 2009. Initially work will occur in the winter taking advantage of the frozen ground conditions to reduce the possibility of any impact on wetlands or permafrost areas.

Any required upgrading to the existing Stewart Crossing access road and substation site, including clearing and ground work, is anticipated to occur in the third quarter of 2008. This would be followed by the construction of the site infrastructure and connection of the lines in the second quarter of 2009. The existing substation will be enlarged and will continue to be fenced and gated. There will be a vehicle access gate and a personnel gate which will be kept locked.

5.5 TRANSMISSION LINE PLANNING AND PRELIMINARY DESIGN

Preliminary design review has been a factor in route selection for the transmission line (for details on route selection, see Chapter 7). Detailed engineering design of the transmission lines will start in early January of 2007 and is expected to be completed by early Q2 2007 for Stage One. Preliminary engineering design for Stage Two is anticipated to be completed by end of Q1 of 2007, with final design work occurring in Q3 2007 depending on funding from YG. Yukon Energy is using a digital centreline survey process involving the use of high quality aerial photos that have been digitized, triangulated and control survey points taken in order to generate a digital terrain model that is accurate to +/- 0.5 m. This model is then used by a digital powerline routing and offset mapping program to generate a digital powerline centreline with pole placements and offsets identified.

General design considerations:

In general, the line has been planned to depart from the Klondike Highway or Minto Mine access road where it can be made significantly shorter and/or to avoid recognized sights, private property or difficult terrain (i.e. either too steep or too wet). Clearing will generally be 15 m and up to 20 m each side of the centreline for the 138 kV line; and 7.5 m up to 10 m for the 35 kV line. It will be based on a 10-year tree free standard. This can be reduced in areas where the transmission line ROW is contiguous with the highway or mine access road ROW. Clearing on steep slopes and the approach to any watercourse will be done by hand. In all cases, danger trees will be removed (Yukon Energy, 2005).

Areas of limited stability (e.g. permafrost or wetlands) will be given particular attention including non-standard spans to improve foundations and construction will be done during the winter to limit disturbance of the terrain. There will be no work done in streams – structures will be selected and placed so that any watercourse will be crossed with a single span. Any stream crossing by equipment would only be done with prior approval of DFO.

Site condition studies at substation locations are anticipated for completion late in 2006, and will be provided, if required, when available.

5.5.1 Line Length

Final line length requirements are determined through the route selection process, which is detailed in Chapter 7. This process balances general technical (engineering), economic and environmental implications of increased line length and the reduction of adverse effects through avoidance of sensitive environmental features.

Based on the route selection process set out in Chapter 7, the approximate line lengths for the preferred routes in each of the four line segments are as follows:

- Carmacks substation to McGregor Creek: 42 km
- McGregor Creek to Pelly Crossing substation: 56 km
- Pelly Crossing substation to Stewart Crossing substation: 74 km
- Minto Landing substation to Minto Mine site substation: 27 km

5.5.2 ROW and Property Requirements

A 60 m ROW width will be required for the 138 kV transmission line between the Carmacks and Stewart Crossing substations. A vegetative buffer of at least 30 m between the Klondike Highway ROW and the transmission line ROW will be left wherever feasible.

A 30 m ROW width will be required for the 35 kV Minto Spur Line between the Minto Landing substation and the Minto Mine site substation. The 35 kV Minto spur line will be within the agreed upon access road ROW that Sherwood Copper and SFN have identified, except at noted deviations such as at Big Creek and along Minto Creek (due to terrain constraints).

The transmission line ROW will be cleared to allow the line to be installed and will be kept cleared of vegetation, as required, so that trees and shrubs do not come in contact with the power line. Yukon Energy determines ROW widths to ensure danger trees cannot hit, damage or come in contact with or within the flashover distance of any portion of the transmission/distribution system and according to the limits of approach standard (the distance a person, machine or conductive material can safely approach energized conductors) as outlined in the *Alberta Electrical & Communications Utility Code*. No vegetation overhang is allowed. (See Appendix 5A.)

Based on the route selection process set out in Chapter 7, the 138 kV line primarily traverses Crown territorial lands and settlement lands for two First Nations – approximately 2.5 km of LSCFN land north of Tatchun Creek; and several blocks of SFN land from south of Minto Landing to north of Pelly Crossing totalling approximately 72 km of First Nation settlement land. The 35 kV line is entirely through SFN settlement land, except for the line exiting the Minto Landing substation which is located on Crown land. Where Crown land is encountered, Yukon Energy will secure the necessary ROW through a Land Use Permit in accordance with *"Territorial Land Use Regulations";* and in the case of within a highway ROW,

in accordance with Government of Yukon Department of Highways *"Permit for Work within the Right-of-Way"* issued under the Highways Act. Where the transmission line crosses privately owned land including First Nation settlement lands, Yukon Energy will secure the necessary registered easements from the First Nations and private land owners following the completion of a final route survey.

5.5.3 Structure and Conductor Design

Structures will consist primarily of wood poles, with options for metal poles or towers where required. Final pole structure locations will be fixed on the basis of digitized mapping and will reflect assessment of engineering and economic factors with respect to line-length, clearing requirements, site-specific topographic and geo-technical considerations, in conjunction with environmental and socio-economic factors.

Subject to detailed engineering analysis, future pole location can be selected as a potential mitigative measure to reduce adverse environmental and aesthetic impacts (i.e. preservation of wilderness views and avoidance of wetlands). Location preferences identified in the course of the PIP, and specifically in discussion with the three First Nations in their traditional territories, will be reflected in the final engineering analysis. This information, in conjunction with more detailed pre-construction evaluation of ROWs respecting cultural and archaeological resources, rare and endangered plant species, etc., will be incorporated where technically and economically feasible in the pole placement.

The structures will be either single pole types, such as the "wishbone" structure, or multiple pole structures, such as H-Frame structures. Typical wood pole types are shown in Figure 5.5-1 for a 138 kV transmission line following the same design as the WAF line between Whitehorse and Carmacks (Figure 5.5-2). Special structures will be employed where longer spans are necessary, for instance at major river crossings. Pole height will typically vary between 14 m and 20 m, depending on site-specific circumstances. Structures will be guyed in areas of unstable or difficult terrain, and as per Yukon Energy's EMS manual all guy wires will be equipped with guy guards for public safety. Figure 5.5-3 shows a typical 35 kV pole structure for use on the MS line. Pole height for the 35 kV line will typically vary between 12 m and 17 m, depending on site-specific circumstances.

Figure 5.5-1
Typical Wood Pole 138 kV Structures

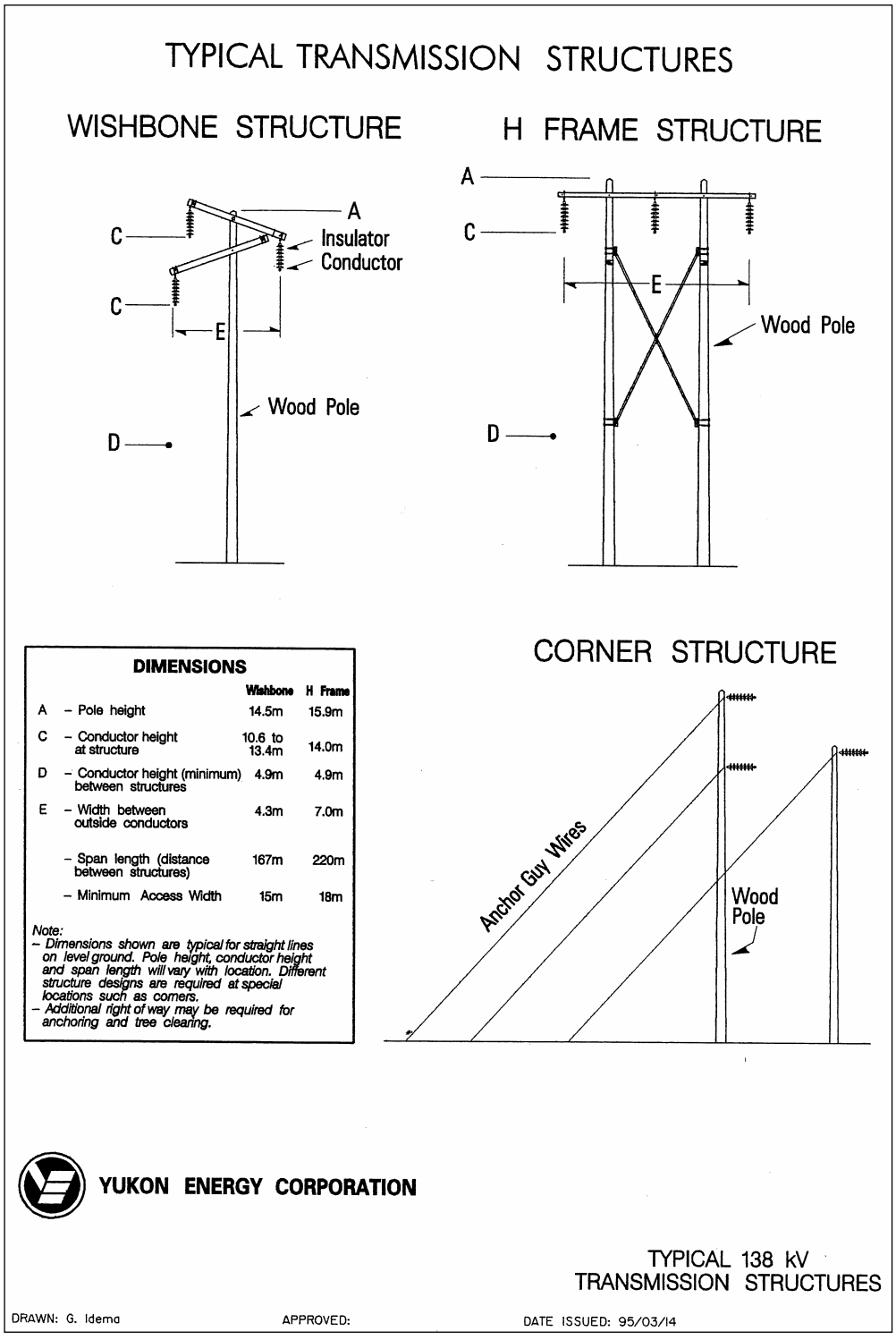


Figure 5.5-2
Typical 138 kV H-Frame Wood Pole Structure (WAF Transmission Line)

Figure 5.5-3
Typical 35 kV Pole Structure

The average span between structures for the 138 kV line will be approximately 150 m to 200 m, resulting in approximately five to seven structures per kilometre. However, spans of up to 900 m are also possible for crossing wetlands, creeks and rivers when there is sufficient clearance by placing H-frames on adjacent ridges or high ground. Yukon Energy will follow DFO's Overhead Line Construction Pacific Region Operational Statement and Riparian Areas guideline included in Reference Material 5R-4 for all line construction activities in the vicinity of waterways and riparian habitat. Longer spans require additional guy wires to offset the pull of the conductor wires over a larger span. The average span for the 35 kV spur line is expected to be approximately 80 m to 100 m, resulting in approximately 10 to 12 structures per kilometre.

The line will generally use standard structures for tangent, small angle, intermediate angle or large angle deflections, and for dead-ending. In general, tangent and small angle structures will each use two poles, a steel cross arm, suspension insulators, and steel braces. Most of the other structures will use three poles, suspension insulators, and an appropriate variety of stand-off brackets. If the ROW is restricted, consideration will be given to using shorter spans on single pole structures of wishbone construction. The H-frame structures are designed to carry a single three-phase circuit consistent with industry standards.

The foundations for the poles will be selected according to the site conditions. These will vary from simple augered holes to rock anchors or extensions such as piles or rock-filled barrels depending on the depth to rock and the type of covering soil. Particular care will be used to avoid any unnecessary disturbance of permafrost.

Anchored guys will be used at dead-ends, deflections, and at unstable sites. The number of guys and the type of anchor will be selected as required for each site. Push braces will not be used unless there is no practical alternative.

5.5.4 Access and Transportation

The access and transportation requirements for the Project will be finalized when the engineering design work is completed. Preferred access to the ROW will be to use existing access trails or roads. If none are available, new access trails will be required to access the ROW between stream crossings and where the land slopes upward or downward. Details on access and transportation requirements are found in Section 5.7.3 under the Construction Phase.

Vehicular traffic at these sites will likely involve both rubber tired and track-mounted vehicles. Any temporary noise generated during the construction phase will be limited to working hours.

5.6 SUB-STATION PLANNING & PRELIMINARY DESIGN

Substation design will follow generally accepted and approved design standards such as established by the Canadian Standards Association, the Institute of Electrical and Electronics Engineers Standards Association and the Alberta Electrical and Communication Utility Code, which are consistent with current industry practice.

5.6.1 Station Concepts, Sites and Property Requirements

General site considerations:

The engineering design work is expected to be completed by the end of March 2007. This will incorporate a soil analysis for the new Carmacks substation and the Pelly and Minto Landing Substations. Information for the Stewart Crossing site is found in Appendix 5R-3. This site would be an expansion of the existing substation and would follow the same type of base preparation as indicated in the appended report (EBA Engineering Consultants Ltd., 2004).

In each of the proposed substation locations, there will be secondary containment around the large oil-filled transformers. All oil containment and materials handling/spill response standards and protocols will be applied through the design, construction and operations phases.

General Property Requirements:

Based on the route selection process set out in Chapter 7, the following identifies the general location of each of the substations. Details on footprint size and site location (including a footprint sketch) are found in Section 5.7.2 below.

- **Carmacks Substation**: Yukon Energy will establish a new substation on reserved land north and east of the town near the airport. The location is adjacent to the existing 138 kV WAF line for ease in connection of the two lines.
- **Minto Landing**: Yukon Energy will construct a new substation on the east side of the Klondike Highway across from the community of Minto Landing. The substation will be located within the EMR reserved parcel of land. Consultation with Department of Highways has resulted in an agreed location in the northeast corner in order to enable power hook-up to their gravel operations.
- **Pelly Crossing**: Yukon Energy will construct a new substation on land immediately to the west of the SFN Lands Department equipment yard.

Yukon Energy will apply for all necessary Land Use Permits to secure the required land for these substations upon completion of detailed engineering study and design.

- **Stewart Crossing**: Stage Two of the Project will include an expansion of the existing substation at Stewart Crossing. The existing substation is located approximately 1.5 km west of the Stewart River bridge on the north side of the Klondike to Dawson City Highway.
- **Minto Mine Site**: Sherwood Copper is building a substation on the north side of their property to service the mine and camp facilities. The MS line will terminate at the Minto Mine substation site with a step down transformer and associated equipment to tie into the existing Minto Mine Site distribution. The location of the substation is seen in Figure 5.6-1.

Figure 5.6-1
Location of Minto Mine Site Substation

5.7 CONSTRUCTION PHASE

Construction of the transmission lines and substations will adhere to Yukon Energy best practices as outlined in their EMS Manual. In all aspects of the construction work, each site will have spill kits on hand and all waterways will be avoided by all wheeled and tracked vehicles.

5.7.1 Transmission Line Construction

Construction of the transmission line will be carried out by experienced contractors, subject to Yukon Energy's EMS, any EPPs specific to this Project and developed after receipt of environmental approvals, and subject to conditions specified in the Land Use Permit. Yukon Energy will have construction inspectors on site throughout the construction process to ensure conformity to specifications and specific mitigation measures. This will include project monitors from the NTFN throughout the construction phase to ensure conformity with the approved route alignment. In addition, where noted in the Heritage Resource Inventory and Assessment Preliminary Report (see Appendix 6G) or as noted as a form of mitigation, an archaeologist will be present to ensure no disturbance can occur to identified archaeological or heritage resources.

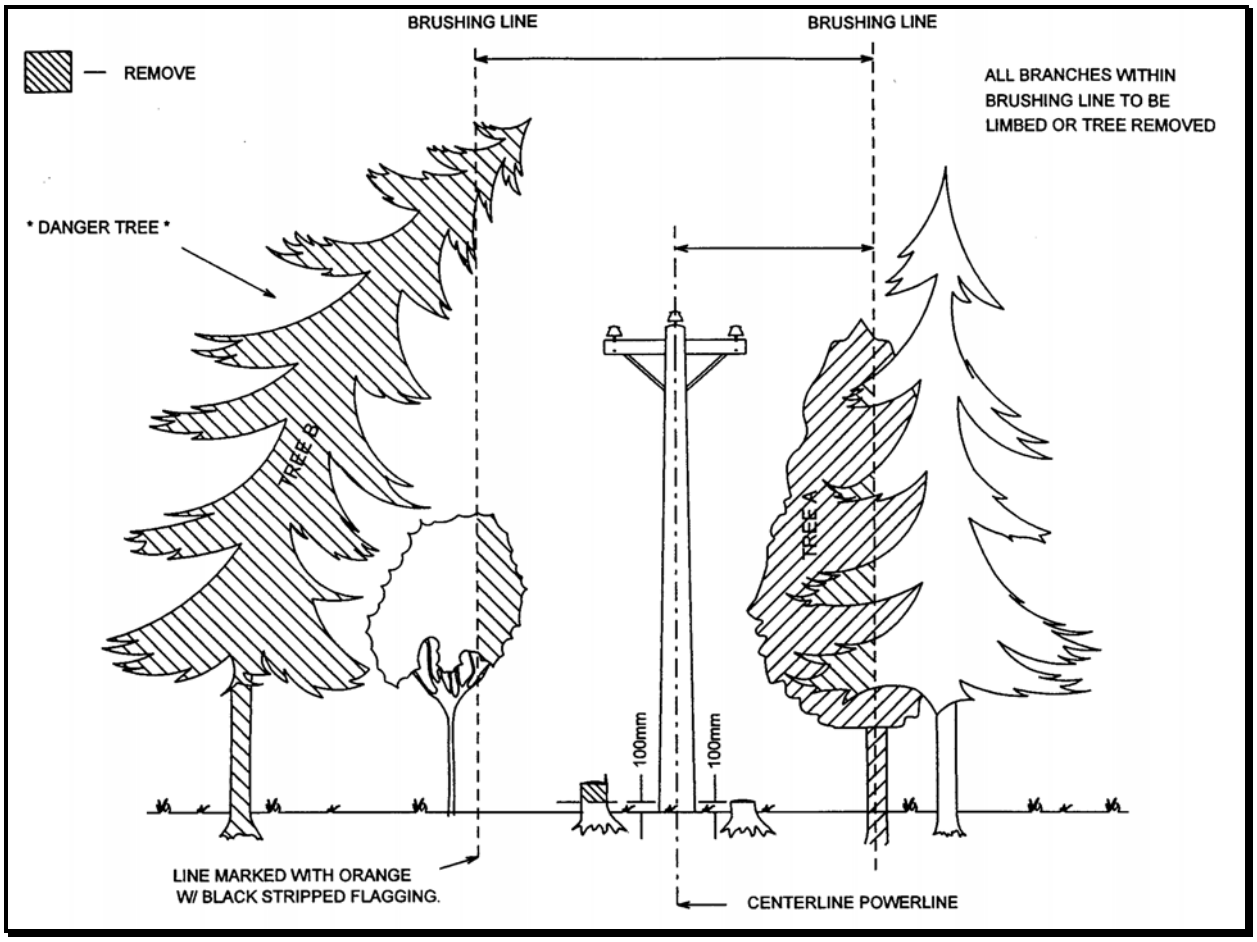
5.7.1.1 Survey and Clearing of ROW

As noted earlier in Section 5.5, the final transmission line routing will be designed through the use of digitized mapping. Prior to construction, the ROW will be flagged by a survey crew using GPS units to establish ROW edges for clearing widths. This work will be done ahead of the ROW brushing and clearing. As an alternative, GPS units may be mounted in the mechanical brushing equipment to identify the ROW.

Clearing and disposal of trees, including danger trees, on the established ROW allows construction activities to proceed and is required for line operation safety and reliability. ROW brushing and clearing also aims at minimizing the risk of wildfires. Brushing and clearing will be carried out in accordance with Yukon Energy EMS Manual best practices (see Appendix 5A). Figure 5.7-1 from Yukon Energy's EMS Manual illustrates brushing and clearing of danger trees.

The cleared ROW width for the 138 kV CS line will generally be 15 m to 20 m from centreline, for a total cleared width of between 30 m and 40 m. The cleared ROW width for the 35 kV MS line will generally be 7.5 m to 10 m from centreline, for a total cleared width of between 15 m and 20 m.

Figure 5.7-1
Clearing of Danger Trees



In accordance with the MOU between Yukon Energy and the three NTFNs, the NTFNs will have the opportunity to provide, on a sole source basis, all route clearing and brushing services required for the Project. ROW clearing will typically be done by mechanical methods. A mechanical feller buncher is mounted on crawler tractors to cut tree growth up to approximately 8 inches in diameter. This method provides minimal ground disturbance (typically done under frozen ground conditions). If mechanical

feller bunchers are not available, a combination of chainsaw and skidders to remove salvageable timber will be used in denser forest cover. Further clearing is expected to be done by bulldozers and excavators. Selective clearing methods (hand clearing with chain saws) are typically used in rugged terrain in the vicinity of all river and stream crossings and sensitive riparian areas.

Slash from the clearing activity will normally be piled within the ROW and burned. Steps will be taken to minimize the contamination of merchantable timber. Salvage of merchantable timber may be available through the Department of Forestry where reasonable merchantable timber volumes are present. Preliminary discussion has been initiated with Forestry Branch of the YTG (personal communication, Forest Management Branch, June 20, 2006). In addition, community and First Nation fuel wood salvage opportunities will be encouraged where safety, access and environmental concerns are manageable.

Typical equipment for ROW clearing may include:

- mechanical feller buncher
- excavators to pile and burn waste wood in machine accessible areas
- tracked bulldozers for building access and some clearing
- grapple skidders to move merchantable timber
- propane fan burners
- fuel trucks (1 ton and 3 ton)
- crew trucks (1/2 ton and ¾ ton)
- chainsaws and brush saws
- spill kits

5.7.1.2 Line Construction

Line construction consists of the following basic activities: establishing the pole foundations, hauling the poles and insulators, hardware and reels of conductor to the ROW; assembling and erecting the structures and installing anchors; installing insulators and stringing of the phase conductors and overhead ground wires; and clean-up. Line construction is generally a specialized skill with line crews coming from outside the territory. Line construction is also anticipated to involve the use of heavy equipment and local labour.

The poles are hauled from the marshalling area (if required) to the identified locations on the ROW with tandem axle trucks and trailers. The structures are then assembled ready for installation into the ground. A digger with an earth auger excavates a hole to the proper depth. The structure is placed into the hole and properly aligned. Backfill is then compacted around the pole to hold it in place. Anchors for the deflection and dead-end structures are then installed and randomly tested to ensure suitable holding capacity.

The stringing operation begins by attaching a large diameter pulley (“dollies”) onto the insulators. The reels of conductor are loaded onto a trailer that secures the reels as the conductor is pulled out. The wire is fed through the dollies and pulled out for a length of approximately 3,200 m. After the conductor is fed out off the reels, it is pulled up to the design tension. After the wire is tensioned, it is put into the

clamps at the bottom of each insulator. A clean-up crew then moves through to ensure all debris has been cleaned up and the line is ready to be energized.

At waterway crossings, structures will be located as far back from the water's edge as possible for maximum stability and prevention of bank damage, with a minimum distance of "15 m from the high water mark or top of bank of any watercourse" according to DFO's riparian areas and revegetation guidelines (See Reference Material 5R-4) Construction procedures used at each required crossing will be based on site-specific considerations such as existing soil and subsurface conditions, biophysical sensitivities and operational requirements. Yukon Energy will follow DFO's Overhead Line Construction Pacific Region Operational Statement and Riparian Areas guideline included in Reference Material 5R-4 for all line construction activities in the vicinity of waterways and riparian habitat.

Typical equipment for line construction could include the following:

- pickups and crew cabs for transportation of crews and small tools
- highway trucks and hiabs for hauling of material from the delivery point to site
- tandem axle trucks and trailers for hauling of poles
- tandem flat decks with hiab, preferably 6 x 6 for ROW access trails
- crawler tractor for access construction
- rubber tired (4 x 4) or skidder backhoes and small tracked excavator
- auger truck
- compressor and hand drills for rock work
- tandem flat line truck with truck mounted crane of required capacity, preferably 6 x 6 for ROW access trails
- fork lift (15T)
- stringing equipment, single drum or bull wheel puller, bull wheel tensioner, rope machine, baby puller, correctly rated for conductor and installation tensions of conductor, reel stands for conductor reel size, 100T press and compressor
- line truck with manlift, preferably 6 x 6 for ROW access trails.
- nodwells (tracked)
- helicopter
- spill kits

5.7.2 Substation construction

General site construction activities

A substation will be developed where the new line connects into the existing systems and where the new line is tapped for intermediate loads. Each will be developed to suit the needs of its specific site. Site preparation activities for substation development will typically include:

- removal of existing vegetation and organic topsoil from the site;
- excavation to a depth of no more than 1.0 m except for specific transformer locations that require additional foundation support, depths could be up to 2.4 m for transformer foundations;
- addition and compaction of aggregate fill material from nearby borrow pits;
- placement of a ground grid of un-insulated copper wire attached in a checkerboard pattern;
- cover materials layer approximately 200mm deep placed on top (Pit Run imported structural fill, free draining screened gravel 25 mm top size) for drainage and vehicular access base.
- addition of a layer of aggregate fill (washed crushed aggregate) until site is level and approximately 200 mm deep; and

Once site improvements have been completed, concrete equipment foundations (i.e. transformer bases, etc.) and necessary grounding arrangements and oil containment systems will be installed. Station apparatus and equipment installations will follow, including filling of equipment with insulating oil, construction clean up and commissioning. Perimeter fencing and vehicular and personnel gates will also be installed, each with appropriate locking mechanisms. Clearing around the substations will be done to a minimum of 15 m around the perimeter of the substation to prevent trees from falling on the fence and substation equipment.

Once complete and commissioned, the stations will be operated 24 hours a day, year round, and will be visited regularly by Yukon Energy personnel performing inspections and maintenance. Qualified operators and maintenance personnel will visit the stations routinely to inspect and maintain the sites and, in the case of contingencies, correct any problems or related environmental effects. Emergency repairs may involve repair or replacement resulting from equipment failure.

Typical equipment for substation construction could include the following:

- back hoe
- compactor
- crew trucks (½ ton and ¾ ton)
- chainsaws and brush saws
- survey equipment
- spill kits
- trucks to haul gravel/aggregate
- mobile crane

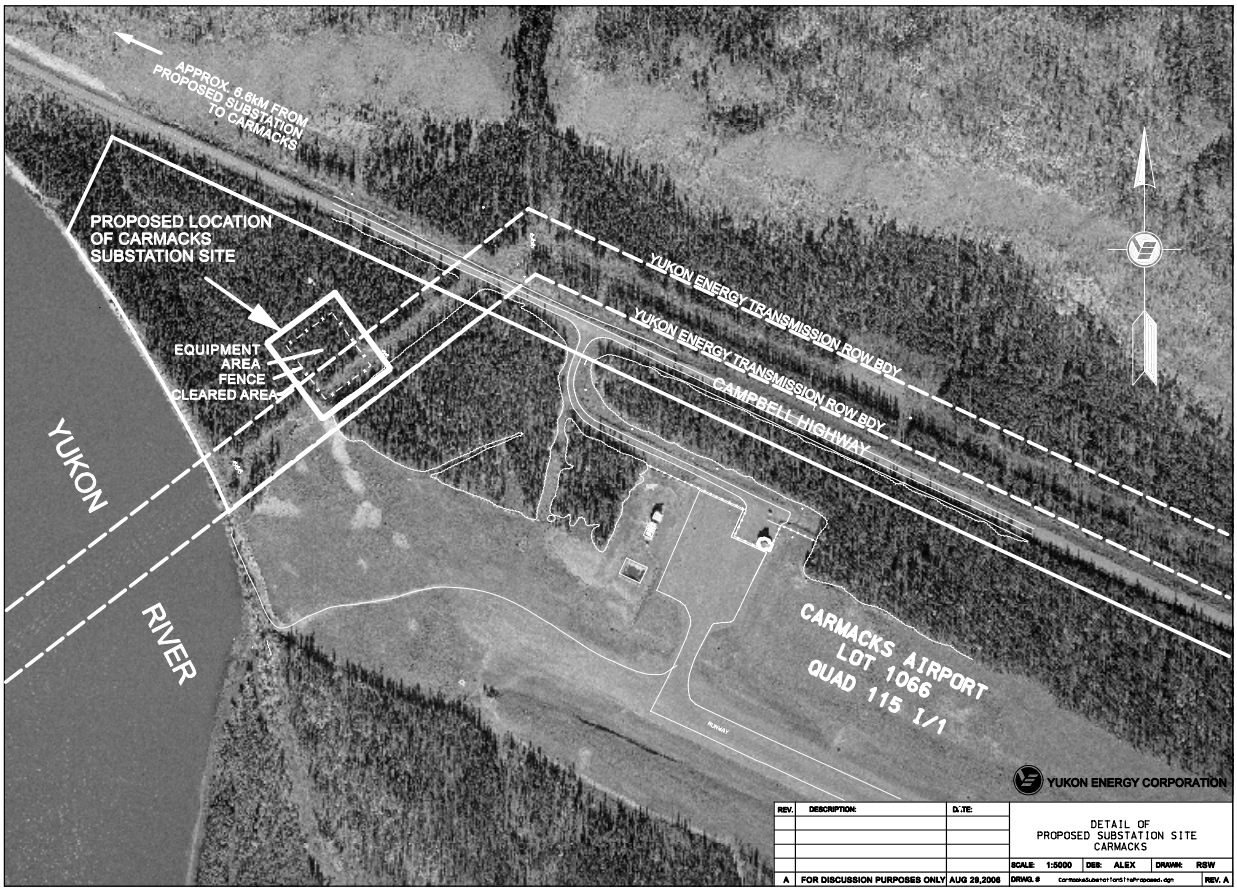
5.7.2.1 Carmacks Substation

Subject to confirmation by design engineering studies (including a study of dynamic stability and voltage regulation), typical electrical equipment for this substation includes:

- a 138 kV bus
- 138 kV circuit breakers
- disconnect switches, fuses, transformers and indoor circuit breakers
- lightning arresters, metering equipment, relays and cables; and
- a synchronous condenser

The station will typically include a building to house the indoor circuit breakers, controls for the 138 kV circuit breakers, space for four more (future) circuit breakers, and the station auxiliaries. The building will be arranged for extension to house future development of the substation and will be 15 m maximum height. A preliminary footprint for the Carmacks substation will be 60 m by 70 m and will be fenced, gated and locked. The substation including gravelled areas will typically be 63 m by 73 m. The site will include a 15 m perimeter clearing around the substation resulting in a total preliminary footprint of 90 m by 100 m. Figure 5.7-2 shows the footprint of the proposed substation.

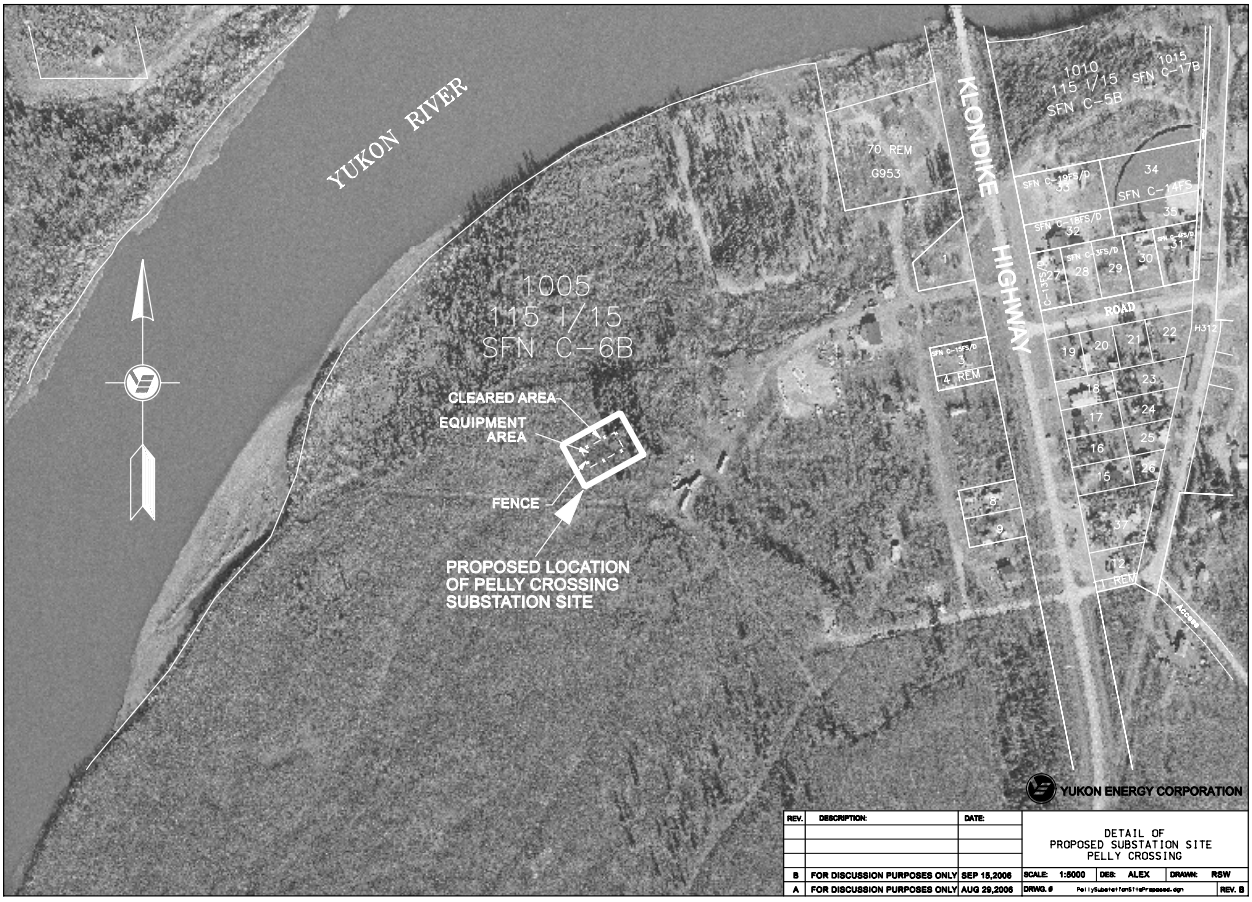
Figure 5.7-2
Carmacks Substation Footprint



5.7.2.2 Pelly Crossing and Minto Landing Substations

The proposed substation at Pelly Crossing will contain a step-down transformer to convert the 138 kV power to either 12 kV or 4.2 kV power for future distribution into Pelly Crossing. A reactor may also be required. Various breakers and electrical switches, electrical measurement devices and a small substation control building will be required. A preliminary footprint will be approximately 20 m by 40 m with a perimeter fence that is gated and locked. A gravelled area will extend 1.5 m in each direction outside the perimeter fence. The site will include a 15 m perimeter clearing around the substation, resulting in a preliminary footprint size of 50 m by 70 m. Maximum structure heights will be 15 m. Figure 5.7-3 shows a sketch of the proposed substation.

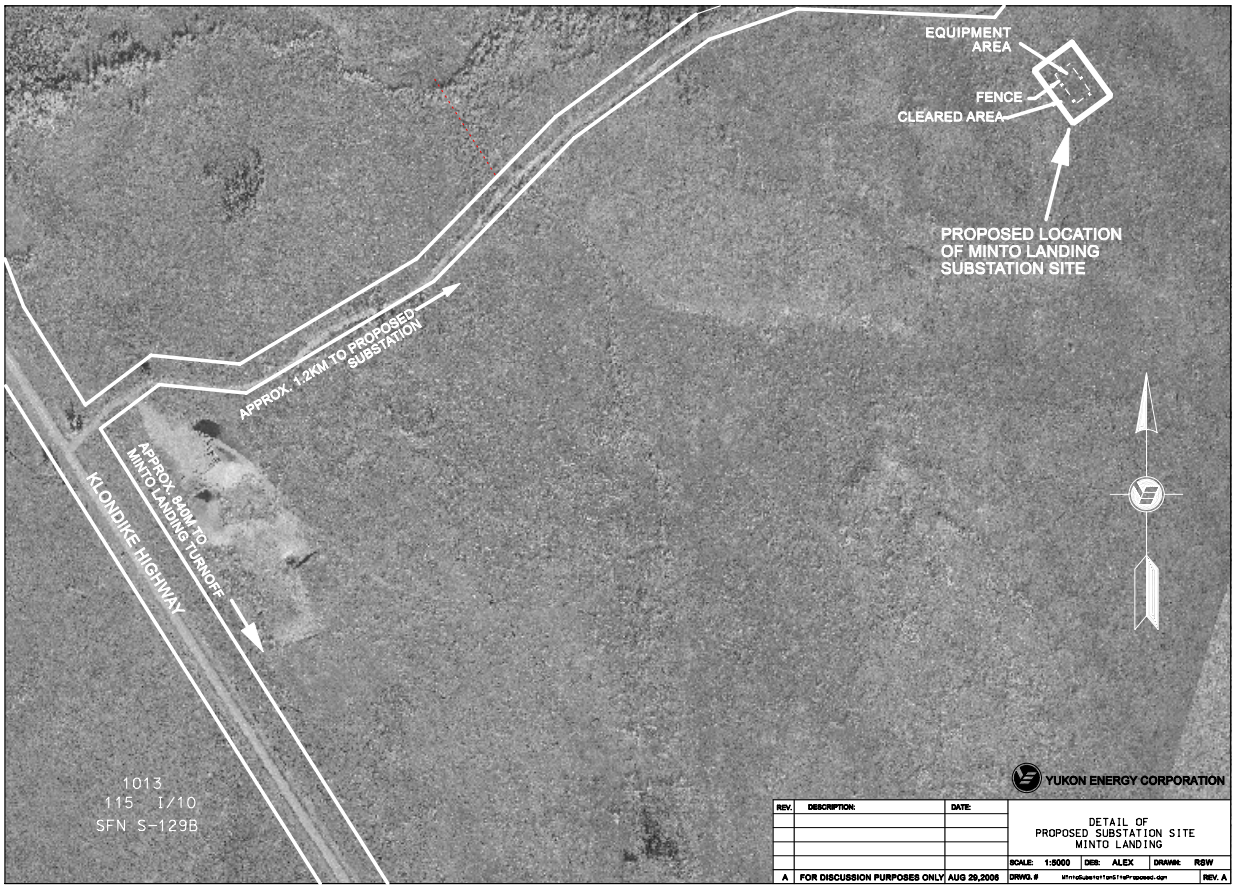
Figure 5.7-3
Footprint Conceptual Layout of the Pelly Crossing Substation



The Minto Landing substation will contain a transformer to step-down the 138 kV power to 35 kV for the Minto Spur line. A reactor may also be required. Various breakers and electrical switches, electrical measurement devices, and a small substation building of maximum height 15 m will likely be required. Size will be approximately 20 m by 40 m for the fence line; 23 m by 43 m for the gravelled area. The

site will include a 15 m perimeter clearing around the substation resulting in a total preliminary footprint of 50 m by 70 m. Figure 5.7-4 shows a sketch of the proposed substation.

Figure 5.7-4
Footprint Conceptual Layout of the Minto Landing Substation



5.7.2.3 Stewart Crossing Substation

Yukon Energy will be required to expand the existing substation at Stewart Crossing to connect the 138 kV CS transmission line and the 69 kV MD transmission line. Site work will include additional clearing and civil work (including built-up gravel pad) in the summer of 2008. Construction of electrical equipment and fencing would occur in spring/summer of 2009. Maximum structure height will be 15 m.

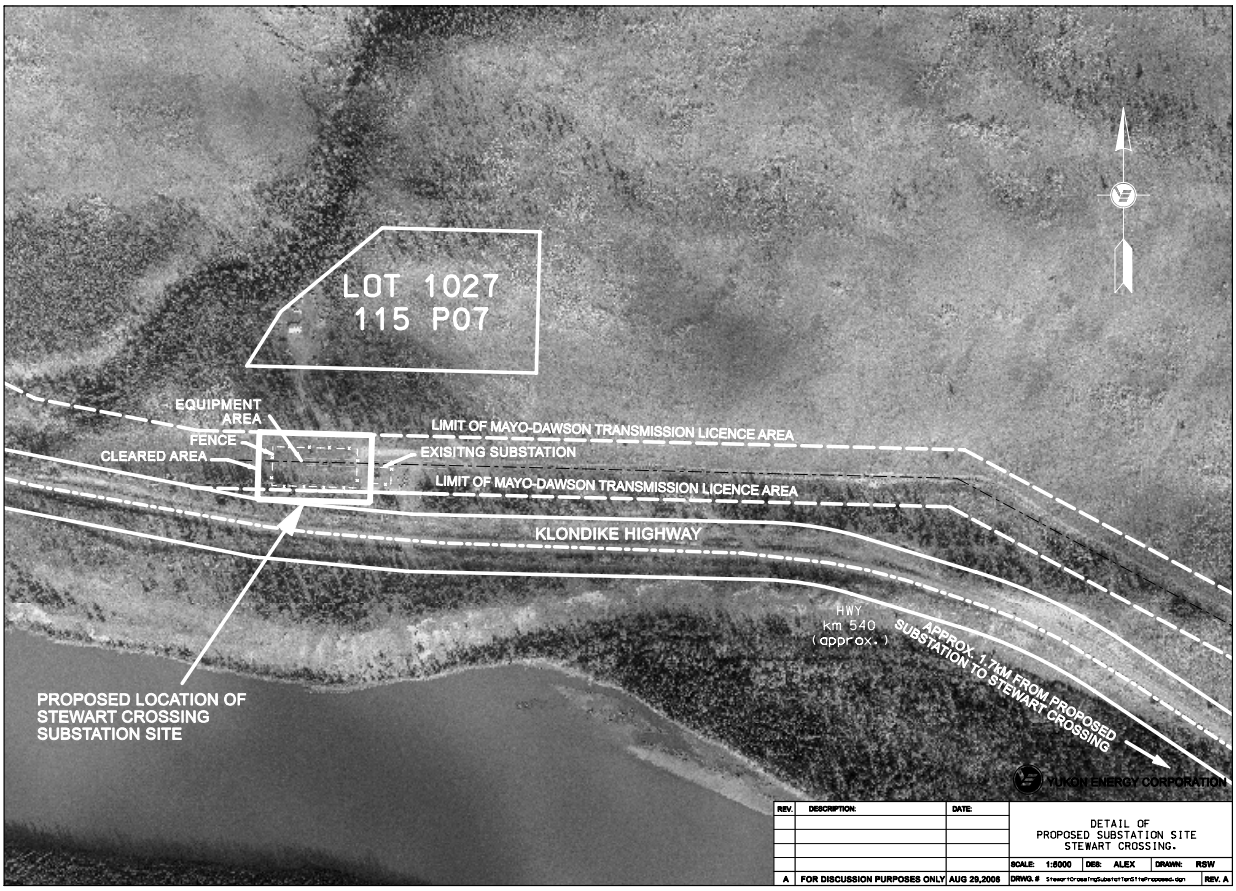
Typical equipment for the expanded Stewart Crossing substation may include the following:

- two transformers, each 138/69-25-4 kV
- two reactors
- capacitor bank
- four 69 kV disconnect switches and 3 – 69 kV circuit breakers
- two - 138 kV disconnect switches and fuses

- various circuit breakers, disconnects, lightning arresters, metering equipment, relays and cables
- small control building housing 4 - 25 kV circuit breakers, up to 12-4 kV circuit breakers and a synchronous condenser
- expansion of existing fencing

This station will likely be terraced with a 69 kV by-pass north of the present line and a 138 kV structure and the transformers south of the line. Additional equipment associated with the Project will be enclosed by a fence about 90 m by 41 m and the entire facility will continue to be gated and locked. A 15 m area around the facility will be cleared of vegetation, resulting in a total preliminary footprint of 120 m by 71 m. Figure 5.7-5 provides a conceptual footprint of this substation.

Figure 5.7-5
Proposed Footprint Layout of the Stewart Crossing Substation



5.7.3 Access and Transportation

Access to any aspect of the Project will follow Yukon Energy EMS Manual on best practices (see Appendix 5.A).

Access for construction and subsequent transmission line maintenance activities will generally occur along the ROW and any existing public access roads or trails. This enables maximum use of existing road access and minimizes the requirement for the development of new temporary trail access. Where no existing access trails exist, temporary access trails may be necessary between the Highway and the ROW. Development of these trails may require installation of culverts to cross ditches. Access trails would be built to accommodate vehicles that are brushing and clearing the ROW – a typical access trail can be approximately 6.5 m wide – 3 m in trail width and 2 m either side for clearance. During construction, these trails must be wide enough to accommodate vehicles delivering line construction equipment, such as poles and cables, to the ROW. ROW access trails will not be regularly maintained post-construction. Construction activity and access requirements will be subject to standard environmental protection measures associated with Yukon Energy's EMS Manual, which describes best practices for transmission line construction (see Appendix 5A).

Water and airborne access:

- Frozen ice surfaces or snow bridges may be used to move materials across water bodies.
- Helicopter access will be used to help string very long spans across the rivers and possibly at Tatchun Creek where a longer span is desirable.

A permanent all-weather access road and associated drainage will be required from the Highway into all substation sites. Each substation will have its own site-specific access road requirements and will be designed as part of the final engineering design phase. Existing territorial highways and roads will be supplemented with newly developed site access roads into the Carmacks, Minto Landing (via the NW Tel access road) and Pelly substations. Use of the existing Stewart Crossing substation access road will continue. Access to the Minto Mine site substation is controlled by Minto Explorations from the mine site.

Vehicular traffic at these sites will likely involve both rubber tired and track-mounted vehicles. Any noise temporarily generated during the construction phase will be limited to working hours.

Material required for substation construction including the access road (i.e. concrete and granular fill) will be obtained where possible from local suppliers (providing specific material specifications can be met) using YG aggregate locations in close proximity to the substation locations. Sources of aggregate supplies have been confirmed with YG Highways and Public Works and are listed in Table 5.7-1 below. All non-toxic waste materials will be disposed of using existing, appropriately licensed local disposal facilities. As with construction activity, material supply and waste handling will be subject to Yukon Energy's best practices and relevant territorial regulations. Excavated organic matter which can be salvaged in the excavation process will be distributed/broadcast in the immediate area to support revegetation. Remaining material will be used where feasible on site during construction. Surplus non-organic material excavated during construction will be used where practical to make berms to restrict access onto the transmission line ROW. In general, erosion control measures will be implemented if required.

Table 5.7-1
Pit Run and Crushed Aggregate Supplies

Substation	Aggregate Supply
Carmacks	Pit ID 115 I-01 (Carmacks Dump) for pit run aggregate Ken Roberts, Carmacks for crushed aggregate (If latter not available, Pit ID 115 I-01 or Pit ID 115 I-09 (on the Robert Campbell Hwy.) can supply once confirmation is received by HPW that Roberts can not supply required crushed aggregate)
Minto Landing	Pit ID 115 I-15 (at Minto Landing) – both pit run and crushed aggregate
Pelly Crossing	Pit ID 115 I-07 (at Pelly Crossing) – both pit run and crushed aggregate
Stewart Crossing	Pit ID 115 P-05 (Stewart Dump Road) and/or Pit ID 115 P-07 – both pit run and crushed aggregate (location chosen will be determined based on haul distances)

5.7.3.1 Carmacks Substation

The Carmacks substation is immediately adjacent to the Robert Campbell Highway. A short all-weather access road will be constructed into the site, complete with associated drainage requirements. The site may also house a small temporary marshalling yard for delivery and storage of equipment and materials during the construction phase of the project. As noted in the previous section, the substation will be fenced and equipped with locked gates for vehicular and pedestrian access.

As noted in the above table, aggregate arrangements have been completed with **Department of Highways and Public Works** (**HPW**) for use of granular fill for the substation gravel pad. Other local suppliers will be contacted prior to construction for the required crushed aggregate for the substation gravel pad. The gravel pad will use an estimated 1,000 m^3 of washed crushed gravel to a depth of 200 mm and 1,000 m^3 of Pit Run and Structural Fill.

5.7.3.2 Pelly Substation

The Pelly substation will be located on land immediately to the west of the SFN Lands Department equipment yard. The existing access road to the equipment yard may require upgrading to ensure an all-weather access road to the substation site is available, complete with associated drainage requirements As noted in the previous section, the substation will be fenced and equipped with locked gates. Aggregate arrangements have been completed with HPW for use of granular fill for the substation gravel pad from their pit just south of Pelly Crossing. The gravel pad will use an estimated 200 m^3 of washed crushed gravel to a depth of 200 mm and 200 m^3 of Pit Run and Structural Fill.

5.7.3.3 Minto Landing Substation

The Minto Landing substation will be located on the east side of the Klondike Highway on EMR reserved land. Consultation with the Department of Highways has refined the location to be beneficial to both Department of Highways for power hook-up, as they use the northern section as a gravel pit, and Transport Canada regarding clearance around the Minto airstrip. A short all-weather access road will be constructed into the site from the NW Tel access road, complete with associated drainage requirements. As noted in the previous section, the substation will be fenced and equipped with locked gates.

Aggregate arrangements have been completed with the HPW for use of granular fill, for the substation gravel pad, from their associated gravel pit to the west of the substation site. The gravel pad will use an estimated 200 m³ of washed crushed gravel to a depth of 200 mm and 200 m³ of Pit Run and Structural Fill.

5.7.3.4 Stewart Crossing Substation

The existing substation at Stewart Crossing has an all-weather access road, approximately 300 m in length, to the site from the North Klondike Highway. This will continue to be used and may require some upgrading. The expanded substation will continue to be fenced and gated. The gravel pad will use an estimated 800 m³ of washed crushed gravel to a depth of 200 mm and 1,000 m³ of Pit Run and Structural Fill. Aggregate arrangements with HPW have been completed (as noted in Table 5.7-1) for crushed and pit run aggregate supplies from either HPW gravel pits in the vicinity of Stewart Crossing.

5.7.4 Fuel and Hazardous Material Management

No explosives are expected to be used for the construction of the substations and the transmission line.

Yukon Energy will adhere to all of the Legislation and Regulations pertaining to the transportation, handling, storage and disposal of fuels and hazardous materials and require any and all contractors to do the same. In addition, the Yukon Energy EMS manual specifies Emergency Response procedures which include spill contingency plans and the storage and handling of hazardous materials (Yukon Energy, 2005). Yukon Energy has developed "Job Site Spill Contingency Plans, Reporting Procedures", which will be followed in all the construction activities (see Appendix 5.D).

The following Acts and Regulations along with Yukon Energy's best practices as outlined in their EMS Manual will be followed:

- Transportation of Dangerous Goods Act (Federal Government)
  - Transportation of Dangerous Goods Regulations (Federal Government)
- Yukon Environment Act (YG)
  - Dangerous Goods Transportation Regulations (YG)
  - Spill Regulations (YG)

5.8 WORK FORCE REQUIREMENTS (CONSTRUCTION PHASE)

Details on work force requirements are provided by construction activity below. Yukon Energy committed in the MOU with the NTFN to strive to avoid issues with final route construction and related land use, such as those experienced with the recent Mayo-Dawson Transmission Project construction. This commitment included the following provision:

- To employ or sponsor the NTFN employment of one or more project monitors whose duties, among other things, shall be to ensure on-site that the Project line, as it is constructed, is at all times located in compliance with the approved final route and access corridor and to bring

forthwith to the attention of the NTFN and Yukon Energy for action any departure or proposed departure there from.

This provision will ensure a NTFN construction monitor be present during construction activities, including ROW flagging, brushing and clearing and line construction activities.

5.8.1 ROW Flagging

ROW flagging for Stage One is estimated to require approximately four to five weeks of effort using one crew, (based on flagging at 5 km/day or 25 km/week and allowing for some weather delay). Stage Two is estimated to require approximately five to six weeks of effort using one crew. With today's electronic design systems and digitized mapping, crews will be able to follow the mapped route with GPS units with a high degree of accuracy (+/- 0.5 m). Sensitive terrain areas that require hand clearing will be flagged prior to brushing and clearing (e.g. wetlands, riparian areas, and other sensitive terrains).

5.8.2 ROW Preparation

ROW clearing and access construction involves a variety of skill levels from the less technical job of piling brush for burning to more skilled jobs such as heavy equipment operators handling timber and road building machinery. The labour component is primarily for fallers and swampers to pile and burn waste wood in hand cleared areas only.

The MOU indicates that NTFN businesses will have the opportunity to provide, on a sole source basis, all route brushing and clearing services. It is yet to be determined how many brushing and clearing crews will be working simultaneously. For example for Stage One Carmacks to Pelly Crossing, one scenario may be as follows:

- a crew may start from Carmacks and work north;
- a second crew may start in Minto Landing and work south;
- a third crew may start from Pelly Crossing and work south to Minto Landing; and
- a fourth crew may work along the MS route from Minto Landing to the mine site.

If time becomes a severe constraint, there will likely be more crews working.

Each crew is anticipated to generally include a feller buncher operator to mechanically clear the growth, a bulldozer/excavator/skidder operator and three labourers to assist. Areas of slope, permafrost and wetlands require hand clearing which necessitates a larger workforce. Assuming four crews as outlined above, a preliminary sample list of potential workforce requirements is identified in Table 5.8-1. This is provided as an example only and does not necessarily represent actual brushing and clearing workforce requirements, which will be determined by the responsible contractor(s).

Table 5.8-1
Brushing and Clearing Workforce Requirements
Stage One: Carmacks to Pelly Crossing

Position	Function	Positions / Crew	Duration	Total # of positions
Feller buncher operator	Tree clearing	1	1.5 months	4
Bulldozer/excavator/skidder operator	Brushing	1	1.5 months	4
Chainsaw operators	Brushing	1	1.5 months	4
Labourers (fellers & swampers)	Brushing	2	1.5 months	8
Truck drivers	Brushing	1	1.5 months	2

5.8.3 Line Construction

The line construction workforce generally requires a higher level of skill sets, qualifications and experience. Table 5.8-2 outlines the requirements by main work activity:

Table 5.8-2
Line Construction Workforce

Work Activity	Skill, Qualification and Experience
Material handling	• Long haul truck drivers • Truck drivers experienced at driving on primitive roads in rough terrain and experienced in operating hiabs and handling poles. Must be experienced in the placing of material to the advantage of the installation crews with minimal supervision • General labourers as helpers, experienced in line hardware
Access & site preparation	• Surveyor, acting as sub-foreman, familiar with soils, transmission line structure staking and general line construction requirements • Heavy equipment operator, experienced in the requirements for providing access on a linear project • General labourer
Wood pole structure framing	• Lineman Supervisor, Journeyman • Lineman, Journeyman • Lineman, Apprentice • Equipment operator (backhoe, auger, crane, etc.) • General labourers
Wood pole and guy anchor installation	• Equipment operator (backhoe, auger, crane, etc.) • General labourers

Work Activity	Skill, Qualification and Experience
Wood pole setting/structure erection	• Lineman Supervisor, Journeyman • Lineman, Journeyman • Lineman, Apprentice • Equipment operator (backhoe, auger, crane, etc.) • General labourers
Conductor installation	• Lineman Supervisor, Journeyman • Lineman, Journeyman • Lineman, Apprentice • Equipment operator (backhoe, crane, etc.) • General labourers
Clean-up	• Equipment operator (backhoe or crawler tractor) • General labourer
Testing and commissioning	• Lineman, Journeyman • Technicians

(Source: Mayo-Dawson preliminary engineering and cost estimating document)

Stage One:

The first activity in line construction is to stake the exact locations for each pole structure. To final stake the estimated 500 to 600 structures between Carmacks and Pelly Crossing, one crew could complete this work in 25 to 30 days (using a rate of 20 structures/day/crew). To final stake the estimated 300 to 375 structures between Minto Landing and the Minto Mine Site, one crew could complete this work in 15 to 20 days (using a rate of 20 structures/day/crew). The project schedule allows a total of two months for this work due to weather delays during December and January.

The second activity is line construction which includes structure framing, structure setting and stringing of the line. It is estimated using a 30 to 40 person line crew, it may take 1 crew approximately 80 to 90 days (or 16 weeks) to build Stage One. It is anticipated a second crew will be required to complete the Minto Spur line segment. Each crew (framing, setting and stringing) will require an inspector in addition to an overall site project manager. The Project schedule allows a total of four months for this work to be completed. Final determination of workforce requirements will be made by the construction contractor hired to complete the work.

Stage Two:

Similarly, to final stake the estimated 600 pole structures between Pelly Crossing and Stewart Crossing, one crew could complete this work in 30+ days. The project schedule allows for a total of two months. Line construction is expected to be similar to Stage One, using a 30 to 40 person line crew. The work is expected to take approximately 60 days of construction (or 12 weeks) to build Stage Two. Each crew will require an inspector in addition to an overall site manager. The Project schedule allows a total of four months for this work to be completed to allow for weather delays and/or equipment failure. Final

determination of workforce requirements will be made by the construction contractor hired to complete the work.

5.8.4 Substation Construction

Substation construction will be carried out in two parts – the civil and site preparation work and the highly technical electrical work. The site preparation component will entail labourers and heavy equipment operators, in addition to a foreman/engineer overseeing the work. Crew size is expected to be between five to ten people. This work will occur concurrently with ROW brushing and clearing and is estimated to take three months for each Stage. Assembly, construction and hook-up of the electrical components of the substations require highly skilled, technical expertise that will be contracted out to an electrical contractor experienced in building electric substations. These activities are scheduled to take three months for each Stage.

5.9 OPERATION AND MAINTENANCE PHASE

The operation and maintenance phase for the CS and MS developments will extend from the end of construction throughout the life of the relevant components of the Project.

- **Stage One operation (CS development from Carmacks to Pelly Crossing and the MS development)**: Stage One operation will begin when Stage One construction is completed (projected to occur in the third quarter of 2008). There is no timetable or plan for decommissioning of the CS Project component (see section 5.10). For the MS Project component, decommissioning for most elements is expected to depend on the economic life of the Minto Mine (expected operating period of about ten to more than thirteen years for most MS facilities - see section 5.10); some MS component elements on the east side of the Yukon River may operate on an ongoing basis, along with the CS component, to service residential and general service customers in the Minto Landing area.

- **Stage Two operation (CS development from Pelly Crossing to Stewart Crossing and connection of the WAF and MD grids):** Stage Two operation will begin when construction is completed (projected to occur at the earliest in the third quarter of 2009). There is no timetable or plan for decommissioning of the CS Project component (see section 5.10).

Operation and maintenance procedures will follow Yukon Energy's best practices as outlined in the EMS Manual (see Appendix 5.A).

5.9.1 Inspection & Maintenance of Facilities

Inspection of the transmission line will be done annually. This will involve inspection by vehicle, where there is road or trail access, and helicopters to fly remote sections of the line. The line patrols include checking for movement of structures, broken insulators, vandalism and other damage to the line. If urgent, the damage is fixed immediately; if not, the repairs are usually scheduled during summer and fall

(Yukon Energy, 2005). Ground inspection can be undertaken using light trucks, all terrain vehicles and snowmobiles. Hardware tightening is generally completed after the first year of operation. Non-scheduled patrols by air or ground may be conducted should unexpected repairs to the line be required.

Maintenance of the cleared ROW while the facilities remain will depend on height of tree growth and likelihood of danger trees coming in contact with the wires; clearing and brushing maintenance will likely recur every seven to ten years. Any required preventative substation maintenance will be performed on an annual basis. Additional monthly inspections are often performed on an as-needed basis.

5.9.2 Operation work force requirements

Transmission lines and substations are designed to operate continuously. Operation and maintenance of the lines and substations may generally be handled within Yukon Energy's present capabilities.

5.9.3 Fuel and Hazardous Material Management

Contractors working on location may have fuel delivered to location by bulk fuel suppliers. These fuels are stored in approved facilities and transported in approved vehicles for this purpose. It is anticipated that the majority of fuels and other hazardous substances will be stored at the Yukon Energy facilities in Whitehorse and Mayo. Any fuels and substances that Yukon Energy may store at these locations, on site, or transported to where it is needed will adhere to all of the Legislation and Regulations pertaining to the transportation, handling, storage and disposal of fuels and hazardous materials. Yukon Energy will require any and all contractors to do the same. In addition, Yukon Energy's EMS manual specifies Emergency Response procedures which include spill contingency plans and the storage and handling of hazardous materials (Appendix 5.A). Any spills related to fuels, construction equipment and substation equipment will follow spill contingency plans and reporting procedures for the specific material as outlined in the "Job Site Spill Contingency Plan, Reporting Procedures" (Appendix 5D).

The following Acts and Regulations along with Yukon Energy's best practices as outlined in their EMS Manual will be followed:

- Transportation of Dangerous Goods Act (Federal Government)
  - Transportation of Dangerous Goods Regulations (Federal Government)
- Yukon Environment Act (YG)
  - Dangerous Goods Transportation Regulations (YG)
  - Spill Regulations (YG)

5.9.4 Project-related Effects

Noise:

Most of any anticipated audible noise will be heard during clearing and construction activities. This will be no different than other activities such as road clearing and construction, wood cutting and general traffic (including the operation of ATVs and snowmobiles). Any noise temporarily generated during the construction phase will be limited to working hours.

Additional noise will come from the background noise of transmission lines and the substations. Small audible noise levels, generated by corona from the proposed 138 kV CS line, may be heard at the edge of the ROW as a slight hissing sound. The audible noise level from a transmission line will decrease by approximately three to four dBA for each doubling of the distance from the line (Wuskwatim, 2003). According to the U.S. Department of Agriculture, Rural Utilities Service, corona noise at voltages less than 230 kV is not very consequential (USDA, 2001).

There will be noise generated by the substations due to the presence of transformers, switches and circuit breakers. All substations are well-removed from noise-sensitive areas or human activity such as residential areas. Given that the location of the CS line is adjacent to an existing highway corridor; the MS line is adjacent to an existing and remote access road; and the substations are a distance from any noise-sensitive development; noise levels are not expected to be a concern.

Electrical and Magnetic Effects:

The PIP raises questions about electrical effects related to the Project.

Other recent environmental reviews of new transmission developments have included review of electrical effects issues. The following comments summarize analysis provided in Section 3.6.3 of the Environmental Impact Statement filed in April 2003 by Manitoba Hydro and Nisichawayasihk Cree Nation for the Wuskwatim Transmission Project.[2]

> EMFs are invisible lines of force surrounding any wire carrying electricity, and are produced by all electric tools and appliances, household wiring, and power lines. A transmission line produces an electric field, a magnetic field and corona. Corona and an electric field can cause electrical effects, the most common of which are radio interference, audible noise, and induction effects of nearby metallic objects.
>
> The strength of electric and magnetic fields depends on the voltage level and the amount of current flow, respectively. The fields around a transmission line fall off sharply with increasing distance from the line. Electric fields are easily blocked by vegetation, buildings and obstacles, while magnetic fields are unaffected by these types of objects.
>
> Many studies on electric and magnetic fields have been completed worldwide. Some studies have shown certain biological responses. Some have indicated a possible association between electric and magnetic fields and human health effects, while others have not. The general consensus of the worldwide scientific community is that a public health risk from exposure to these fields has not been established. Position statements adopted by federal and provincial health agencies express the same view. A recent health and EMF expert's consensus statement on human health effects of EMFs suggests that "*the weight of scientific evidence does not support the conclusion that extremely low frequency EMFs, such as those produced by power*

[2] The Wuskwatim Transmission Project involved 230 kV lines and related stations.

lines, are a cause of adverse effects on human health" (Manitoba Clean Environment Commission, March 2001). The consensus statement also states that *"research to date has not confirmed any biophysical mechanisms that would link properties of power and frequency fields to the initiation or promotion of cancer or any other adverse effects on human health"*.

While Yukon Energy is sensitive to public concerns regarding possible health effects from electric and magnetic fields, there is at present no scientific evidence to justify modification of existing practices or facilities for the transmission and distribution of electricity.

5.10 DECOMMISSIONING/ABANDONMENT/RECLAMATION PHASE

For the CS Project component, there is no timetable or plan for final disposition or decommissioning the Project facilities. The design life of the facility before substantial refurbishment is 50 to 100 years. This is so far into the future that it is not feasible today, based on available information and agreements, to provide meaningful assessment of likely plans or their effects for rehabilitating the operational components and related infrastructure of the Project at the end of operational life. When such plans need to be developed, Yukon Energy would submit these plans as then required for regulatory review and approval prior to its implementation. Accordingly, as reviewed in Chapter 3 (section 3.3.1), the Project Proposal does not provide any further assessment of the CS Project final disposition.

For the MS Project component, the timetable for final disposition or decommissioning of most components of the Project facilities (other than potentially the MS facilities located on the east side of the Yukon River) is dependant on the realized economic life of the Minto Mine. Currently, the operator of the mine estimates that the existing reserves and operation will facilitate an economic mine life of at least slightly more than seven years, and potentially more than about 10 years, and that some power would continue to be required for about four years thereafter before full decommissioning of mine facilities would occur[3]; based on these estimates, and the expected operation start dates for the mine (spring/summer 2007) and the MS facilities (fall 2008), decommissioning of the relevant MS facilities would be expected to occur potentially as soon as 2018 and as late as after 2021 (i.e., after ten to more than thirteen years of MS operation).

Anticipated decommissioning activities for the MS facilities are reviewed below.[4]

[3] As at August 28, 2006, Sherwood Copper announced an update to the Feasibility Study on the Minto Mine with an optimized mine plan with a mine life of 7.2 years after mine operation start (expected in spring/summer 2007); power loads for years 2 through 7 are forecast at 32.5 GWh/year, and at 3.4 GWh in the 8th year. Shut down activities with greatly reduced power loads (about 0.876 GWh/year) are forecast to be required for three years thereafter. Sherwood's stated objective is that resource definition drilling currently underway at Area 2 on the Minto property would result in the deferral of stock pile processing in Year 7, and continued processing of high grade material for several more years at grades similar to those projected for the first six years of operations. Stockpiled low grade material will also be available for processing in the future should economics warrant after processing of higher grade material has been completed.

[4] The following information on decommissioning activities has been adapted (and approved by Yukon Energy) from Manitoba Hydro's document: *Manitoba Hydro (1995) Fur, Feathers & Transmission Lines – Oji-Cree: How rights of way affect wildlife. Written by Robert P. Berger, Wildlife Resource Consulting Services MB Inc*

5.10.1 Decommissioning Transmission Towers / Poles

Decommissioning of conductor support poles/towers involves dismantling structures and the salvage or disposal of all steel and wood pole components. Decommissioning also involves the collection and salvage or disposal of conductor and counterpoise (ground wire).

Possible environmental concerns and regulatory requirements resulting from the decommissioning of poles/towers and ROW involve the following:

- Disposal of waste material
- Disposal of hazardous material
- Remediation of contaminated soils
- Proliferation of noxious weeds in ROW
- Maintenance of public safety
- Alteration of habitat

To ensure that the ROW is left in a state that will allow for future land use or natural re-growth of the indigenous vegetation the following steps will be taken:

a) All conductors, insulators, counterpoise and other material employed in transmission lines will be collected and removed from the ROW. Salvageable materials will be salvaged. Other materials will be collected and transported to an approved landfill site.
b) After materials have been removed, the ROW will be inspected to ensure that all materials have been retrieved and that the ROW will be left clean.
c) All tower foundation structures will be excavated and removed.
d) All holes or ruts created by foundation removal or ROW travel will be filled or graded. In agricultural land, at least 300 mm of topsoil should be spread on any excavation site.

5.10.2 Decommissioning Transmission ROW

In the event of decommissioning, an alternative use will be identified for the property. That use will determine many of the environmental measures that may have to be undertaken to convert a ROW to another use. The following measures will, nevertheless, be undertaken:

a) If required, the ROW will be graded, disked or ploughed to remove ruts caused by rubber-tired and tracked vehicles.
b) Where any grading, disking or ploughing is required, the disturbed area will be reseeded if the disturbed area is extensive and root zones have been disturbed.
c) Noxious weeds along a ROW in agricultural land will be ploughed or sprayed with an approved herbicide at the request of the land holder.
d) In forest or wooded areas, if the abandoned transmission line is not to be replaced by a new transmission line on the same ROW, the unused ROW will be allowed to re-vegetate naturally. Specific areas subject to erosion may be reseeded manually.

5.10.3 Decommissioning Access Roads/Trails

When an access road/trail is no longer required, it may be decommissioned if no other permitted use is identified. Some roads/trails can be simply left to naturally rehabilitate; however, most require some physical action prior to abandonment. Decommissioning involves the removal of any drainage structures, road material and any associated steps to minimize and control erosion. The following environmental practices should be considered:

a) The road/trail should be inspected prior to decommissioning to document areas of staining, stressed vegetation, debris, etc. Soil and ground water samples should be taken at suspect areas to delineate the extent of any contaminated areas.
b) Access road/trail ownership and management may be transferred to the adjacent landowner, First Nation, or the Crown. Often, these stakeholders will request that access roads/trails remain intact for public use. Yukon Energy will leave access roads/trails in a serviceable condition for future maintenance requirements. This may require partial obstruction of access to ROWs.
c) Natural regeneration of abandoned roads/trails should be considered wherever possible.
d) The road/trail and ditch should be graded to allow coverage of suitable material for natural vegetation regeneration.
e) Where possible, banks and approaches should be graded to match existing topography.
f) Removing culverts and crossings and breaking up the access road/trail allows natural drainage paths to be restored.
g) The entrance to the abandoned access road/trail may be suitably barricaded to prevent vehicle access.
h) Ongoing visual inspection is required to ensure adequate restoration and minimal environmental degradation.

5.10.4 Decommissioning Transmission Stream or River Crossings

Decommissioning transmission stream and river crossings requires the same sensitivity as constructing transmission lines in the vicinity of waterways and riparian habitat in order to mitigate against potential adverse environmental effects. As previously noted, Yukon Energy will follow DFO's Overhead Line Construction Pacific Region Operational Statement and Riparian Areas guideline included in Reference Material 5R-4 for all line construction activities in the vicinity of waterways and riparian habitat (see section 5.7.1.2)

Prior to decommissioning any transmission stream or river crossing, the Proponent will contact DFO to secure any needed permits and will provide information as required on how many times the watercourse will be crossed, types of vehicles to be used, timing of activities and other stipulated information. Yukon Energy will follow all requirements set out in any permits.

5.10.5 Decommissioning Substations

The MS substation is not anticipated to be decommissioned upon closure of the Minto Mine, as the facility is expected to continue to be used by the community of Minto Landing. If at some time in the future it

is deemed necessary to decommission this substation, the following is indicative of the measures expected to be followed.

Decommissioning substations requires removal of the structures, equipment and gravel pad, the salvage of reusable materials and the disposal of all unusable materials. The site must then be remediated to accommodate future land use.

There are environmental concerns and regulatory requirements for the decommissioning of substations including:

- Disposal of conventional solid waste material
- Disposal of hazardous materials
- Remediation of contaminated soils
- Determining alternative uses of the site

Upon decision to decommission a substation, alternative uses of the site will be assessed and a preferred use determined.

a) All above ground and underground obstacles that could impede the future use or re-mediation of the site will be removed.
b) Electrical equipment and associated structures will be dismantled and salvaged. All unsalvageable material will be transported to an approved landfill site.
c) Footings and foundations will be removed to a depth of 2 m. Waste concrete will be removed to an approved landfill site.
d) Random samples of soil will be taken to determine levels of contamination for possible contaminants.
e) PCB contaminated soils (in accordance with Federal Department of the Environment Chlorobiphenyls Regulations, 1991) will be removed to an approved storage and/or disposal facility (transformers and equipment installed for this Project will not contain PCBs).
f) Removed soil will be replaced with uncontaminated material.
g) If the site reverts to a natural state, all surface granular materials will be removed from the site and replaced with clean uncontaminated fill.
h) Soil materials will be selected depending on the nature of the proposed use.
i) Depending on the extent of petroleum contamination in soils, remediation may involve in situ treatment, disposal to the local landfill, disposal at a licensed hazardous materials facility, or on-site soil reclamation. A careful investigation of contaminant parameters, future land use, site risks, and remedial technologies must be conducted prior to implementing a remediation plan.